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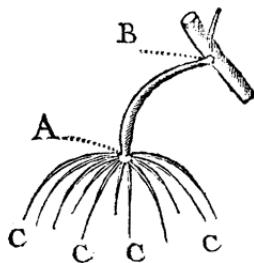
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The Figure of the Fresh-water Polypus, sticking to a Twig.



Observations and Experiments upon the Fresh-water POLYPUS, by Monsieur Trembley, at the Hague. Translated from the French by P. H. Z. F. R. S.

THE Animal in question is an aquatrick Insect, of which mention is made in the *Philosophical Transactions* for the Year 1703. N°. 283. Art. IV. pag. 1307. and N°. 288. Art. I. pag. 1494.

It is represented in the Figure annexed. Its Body *AB*, which is pretty slender, has on its anterior Extremity *A*. several Horns *AC*. which serve it instead of Legs and Arms, and which are yet slenderer than the Body. The Mouth of the *Polypus* is in that anterior Extremity; it opens into the Stomach, which takes up the whole Length of the Body *AB*. This whole Body forms but one Pipe; a sort of a Gut, which can be open'd at both Ends.

The Length of the Body of a *Polypus* varies according to its different Species, and according to many other Circumstances, to be mentioned hereafter.

I know two Species, of which I have seen some Individuals extend their Bodies to the Length of an Inch and a half; but this is uncommon. Few are generally found above 9 or 10 Lines long; and even these are of the larger Kind.

The Body of the *Polypus* can contract itself, so as not to be above a Line, or thereabouts, in Length.

Both in contracting and extending itself, it can stop at any Degree imaginable, between that of the greatest Extension, and of the greatest Contraction.

The Length of the Arms of the *Polypus* differs also according to the several Species: Those of one of the Species that I know, can be extended to the Length of seven Inches at least.

The Number of Legs or Arms is not always the same in the same Species. One seldom sees in a *Polypus*, come to its full Growth, fewer than six.

The same may be said of the Extension, and of the Contraction of the Arms, which I have said concerning the Body.

The Body and the Arms admit of Inflexion in all their Parts, and that in all manner of Ways.

From the different Degrees of Extension, Contraction, and Inflexion, which the Body and the Arms of the *Polypus* admit of, results a great Variety of Figures, which they can form themselves into.

These Insects do not swim, they crawl upon all the Bodies they meet with in the Water, upon the Ground, upon Plants, upon Pieces of Wood, &c.

Their most common Position is, to fix themselves by their posterior End *B.* to something, and so stretch their Body and Arms forwards into the Water.

They

They make use of their progressive Motion, to place themselves conveniently, so as to catch their Prey. They are voracious Animals : Their Arms extended into the Water, are so many Snares which they set for Numbers of small Insects that are swimming there. As soon as any of them touches one of the Arms, it is caught.

The *Polypus* being seized of a Prey, conveys it to his Mouth, by contracting or bending his Arm. If the Prey be strong enough to make Resistance, he makes use of several Arms.

A *Polypus* can master a Worm twice or thrice as long as himself. He seizes it, he draws it to his Mouth, and what is more, swallows it whole.

If the Worm comes endways to the Mouth, he swallows it by that End ; if not, he makes it enter double into his Stomach, and the Skin of the *Polypus* gives way. The Size of the Stomach extends itself so as to take in a much larger Bulk than that of the *Polypus* itself, before it swallowed that Worm. The Worm is forced to make several Windings and Folds in the Stomach, but does not keep there long alive ; the *Polypus* sucks it, and after having drawn from it what serves for his Nourishment, he voids the Remainder by his Mouth, and these are his Excrements. According as the Weather is more or less hot, the *Polypus* eats more or less, oftener or less often.

They grow in Proportion to what they eat ; they can bear to be whole Months without eating, but then they waste in Proportion to their Fasting.

The Observations related in the *Philosophical Transactions*, principally concern the Manner in which

which these Insects multiply. What is there said of them, is true and exact. The more one searches into the Manner how a *Polypus* comes from the Body of its Parent, the more evidently is one persuaded, that it is done by a true Vegetation.

There is not on the Body of a *Polypus* any distinguished Place, by which they bring forth their Young. I have some of them, that have greatly multiplied under my Eyes, and of which I might almost say, that they have produced young ones, from all the exterior Parts of their Body.

A *Polypus* does not always put forth a single young one at a time; it is a common thing to find those which produce five or six: I have kept some which have put forth nine or ten at the same Time, and when one dropt off, another came in its Place.

These Insects seem so many Stems from which issue many Branches. I have learned by a continual Attention to two Species of them, that all the Individuals of these Species produce young ones.

I have for two Years had under my Eye thousands of them; and though I have observed them constantly, and with Attention, I never observed any thing like Copulation.

Upon Supposition, that this Copulation is perform'd in some secret Manner: I tried at first to be sure it had not Place between two of them, after they were severed from the Body of their Parent. To this end, I took young ones, the Moment they came from the Parent, which was alone in a Glass; or I even parted them with Scissars: Each of these young ones I put into perfect Solitude, I fed them every one separately in a Glass; they all multiplied, not only them-

themselves, but also their Offsprings, which from Generation to Generation, as far as the Seventh, were all confined to Solitude with the same Precaution.

Another Fact, which I have observed, has proved to me, that they have the Faculty of multiplying, before they are severed from their Parent. I have seen a *Polypus*, still adhering, bring forth young ones; and those young ones themselves have also brought forth others. Upon Supposition, that perhaps there was some Copulation between the Parent and young ones, whilst they were yet united; or between the young ones coming from the Body of the same Parent; I made divers Experiments, to be sure of the Fact; but not one of those Experiments ever led me to any thing that could give the Idea of a Copulation.

The *Polypus* multiplies more or less, as he is more or less fed, and as the Weather is more or less warm. If plenty of Food, and a sufficient Degree of Warmth concur, they multiply prodigiously.

I now proceed to the Singularities resulting from the Operations I have tried upon them.

If the Body of a *Polypus* is cut into two Parts transversely, each of those Parts becomes a complete *Polypus*. On the very Day of the Operation, the first Part, or anterior End of the *Polypus*, that is, the Head, the Mouth, and the Arms; this Part, I say, lengthens itself, it creeps, and eats.

The second Part, which has no Head, gets one; a Mouth forms itself, at the anterior End; and shoots forth Arms. This Reproduction comes about more or less quickly, according as the Weather is more or less warm. In Summer, I have seen Arms begin to sprout

sprout out 24 Hours after the Operation, and the new Head perfected in every respect in a few Days.

Each of those Parts, thus become a perfect *Polypus*, performs absolutely all its Functions. It creeps, it eats, it grows, and it multiplies; and all that, as much as a *Polypus* which never had been cut.

In whatever Place the Body of a *Polypus* is cut, whether in the Middle, or more or less near the Head, or the posterior Part, the Experiment has always the same Success.

If a *Polypus* is cut transversly, at the same Moment, into three or four Parts, they all equally become so many complete ones.

The Animal is too small to be cut at the same time into a great Number of Parts; I therefore did it successively. I first cut a *Polypus* into four Parts, and let them grow; next, I cut those Quarters again; and at this rate I proceeded, till I had made 50 out of one single one: And here I stopp'd, for there would have been no End of the Experiment.

I have now actually by me several Parts of the same *Polypus*, cut into Pieces above a Year ago; since which time, they have produced a great Number of young ones.

A *Polypus* may also be cut in two, lengthways. Beginning by the Head, one first splits the said Head, and afterwards the Stomach: The *Polypus* being in the Form of a Pipe, each Half of what is thus cut lengthways forms a Half-pipe; the anterior Extremity of which is terminated by the half of the Head, the half of the Mouth, and Part of the Arms. It is not long before the two Edges of those Half-pipes close, after the Operation: They generally begin at the posterior

posterior Part, and close up by degrees to the anterior Part. Then, each Half-pipe becomes a Whole-one, complete : A Stomach is formed, in which nothing is wanting ; and out of each Half-mouth a Whole-one is formed also.

I have seen all this done in less than an Hour ; and that the *Polypus*, produced from each of those Halves, at the End of that time did not differ from the Whole-ones, except that it had fewer Arms ; but in a few Days more grew out.

I have cut a *Polypus*, lengthways, between Seven and Eight in the Morning ; and between Two and Three in the Afternoon, each of the Parts has been able to eat a Worm as long as itself.

If a *Polypus* is cut lengthways, beginning at the Head, and the Section is not carried quite through ; the Result is, a *Polypus* with two Bodies, two Heads, and one Tail. Some of those Bodies and Heads may again be cut, lengthways, soon after. In this manner I have produced a *Polypus* that had seven Bodies, as many Heads, and one Tail. I afterwards, at once, cut off the seven Heads of this new *Hydra* : Seven others grew again ; and the Heads, that were cut off, became each a complete *Polypus*.

I cut a *Polypus*, transversly, into two Parts : I put these two Parts close to each other again, and they re-united where they had been cut. The *Polypus*, thus reunited, eat the Day after it had undergone this Operation : It is since grown, and has multiplied.

I took the posterior Part of one *Polypus*, and the anterior of another, and I have brought them to reunite in the same manner as the foregoing : Next Day, the *Polypus* that resulted, eat : It has continued well these

two Months, since the Operation : It is grown, and has put forth young ones, from each of the Parts of which it was formed. The two foregoing Experiments do not always succeed ; it often happens, that the two Parts will not join again.

In order to comprehend the Experiment I am now going to speak of, one should recollect, that the whole Body of a *Polypus* forms only one Pipe, a sort of Gut, or Pouch.

I have been able to turn that Pouch, that Body of the *Polypus*, inside-outwards ; as one may turn a Stocking.

I have several by me, that have remained turned in this manner ; their Inside is become their Outside, and their Outside their Inside : They eat, they grow, and they multiply, as if they had never been turned.

Facts like these I have related, to be admitted, require the most convincing Proofs. I venture to say, I am able to produce such Proofs.

They arise from the Detail of my Experiments, from the Precautions I have taken to avoid all Uncertainties, from the Care I have used to repeat the same Experiment several times, from the Assiduity and Attention with which I have observed them.

All this would require a Discussion too long to be here related.

I might also appeal to the Quality and the Number of the Persons who have been Witnesses to these Facts ; as well of those who have seen *me* observe, as of those who have observed *themselves*.

For Brevity-sake, I have omitted several curious and material Facts.

If any Persons in *England* shall be desirous to make Observations on the *Polypus*, and to repeat my Experiments; I hope I shall be able to send some over, in case they shall not be found there.

They are to be look'd for in such Ditches whose Water is stock'd with small Insects. Pieces of Wood, Leaves, aquatic Plants, in short, every thing is to be taken out of the Water, that is met with at the Bottom, or on the Surface of the Water, on the Edges, and in the Middle of the Ditches. What is thus taken out, must be put into a Glass of clear Water, and these Insects, if there are any, will soon discover themselves; especially if the Glass is let stand a little, without moving it; for thus the Insects, which contract themselves when they are first taken out, will again extend themselves when they are at Rest, and become thereby so much the more remarkable.

In order to feed them, one must know how to provide one's self with Insects fit for their Food.

If that is thought necessary, I will point out the Means I make use of for that Purpose.

I am ready to impart to every one who shall desire to make Observations on these Animals, all the Means and Contrivances I have used; to enable them to practise the same, and to judge of them.

I shall set forth all these Means and Contrivances in the History of the *Polypus*, which I am now at work upon. But if, before its Publication, any Informations should be desired, I again repeat, that I shall be ready and willing to furnish them.